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POPULAR MECHANICS

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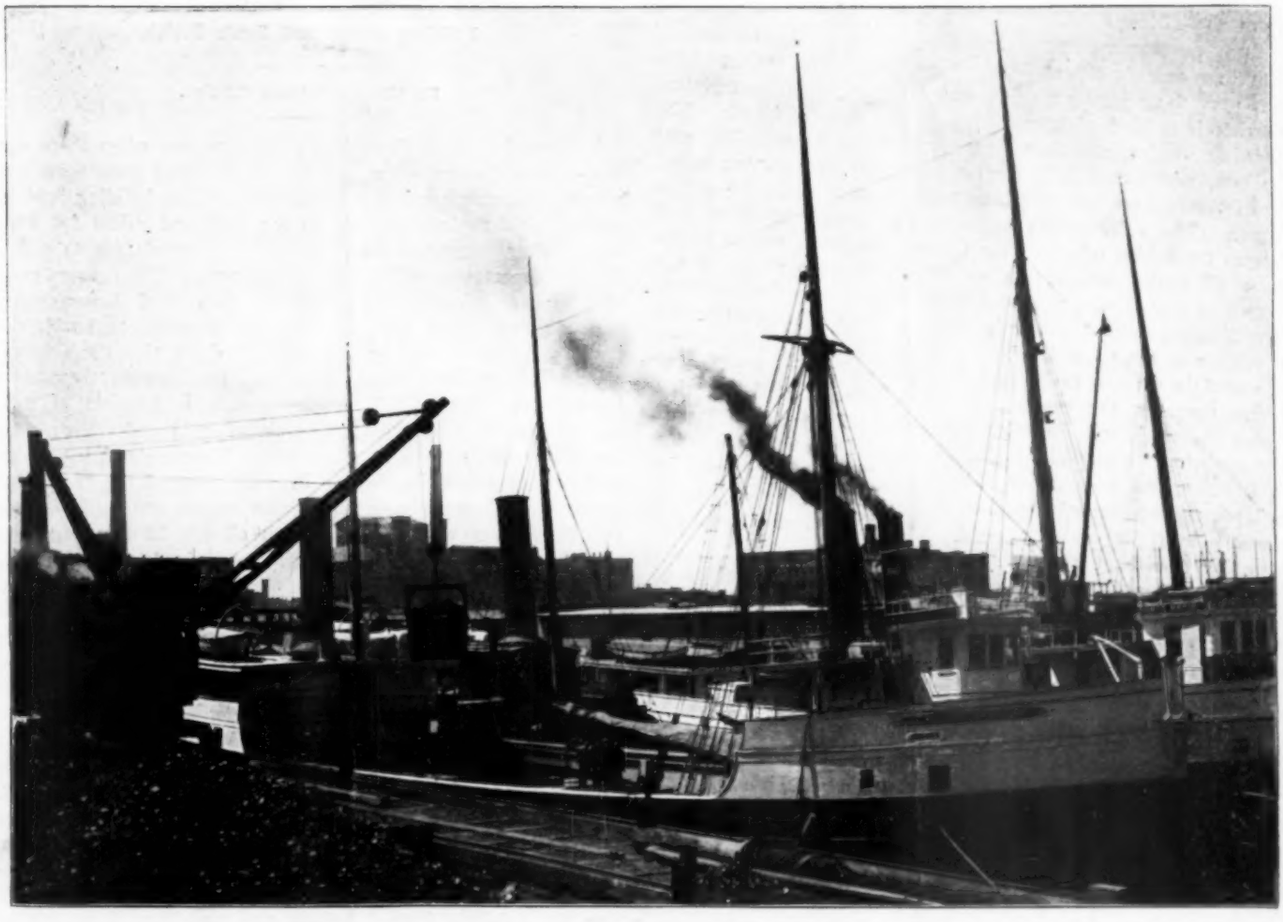
Coaling Vessels in a Busy Harbor



New System Remarkable for Its Speed Born of the Increased Shipping Facilities on America's Great Lakes

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Summer Course in Easy Mechanics—The Canvas Canoe (Concluded).
Laundries of the World—Part IV—The Scottish Highlanders.
The Mariner's Compass, Showing Every Point and Degree.

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COALING VESSELS ON AMERICA'S GREAT LAKES.

The Traveling Derrick Has Done Away With Old Time Methods and is a Marvel of Speed and Convenience.

Larger and heavier boats that have made their way into the great lakes harbors of late years have worked material changes in the former methods of coaling. The old way of shoveling in coal by hand or dumping it into the vessel by the old time machinery was entirely too slow for such vessels as the Northwest, the North Town or the Northland, each of which loaded up with about 500 tons of coal every time they started on a trip from Chicago to Buffalo. There are 18,000 vessels in and out of the Chicago port every year, nearly all of which arrive and depart during the warm months between May and November. These vessels, representing a tonnage of 16,000,000 tons, necessitated the loading of several millions of tons of coal from the Chicago dock.

Such enormous demands brought into use the mechanical traveling derrick, shown in the front page illustration. This has proved an ideal of speed and convenience. The traveling derrick is a kind of house, or engine room on wheels. The hoisting engine and drum are inside the house. The coal buckets, which may hold from 1 to 5 tons of coal, are raised and lowered from the movable crane extending from the engine house. The cable which operates the crane and raises and lowers the bucket winds on the drum. The entire engine house, with all equipments, moves on a pivot on the scow, or car frame, so that it may revolve back and forth or entirely around. The hoisting outfit has wheels and runs on a track so that the derrick may run up and down the coal dock to any point where a vessel is waiting to be coaled. The engine in the engine house operates the entire machinery, propelling the derrick along the track and operating the gearing for the handling of the buckets of coal. The bucket is loaded from the dock when it is raised and swung over the vessel. Then by the touch of a latch the bottom of the bucket opens and the coal drops directly into the coal magazine. The illustration shows the traveling derrick at work in the Chicago harbor.

The Dunham Towing & Wrecking Company use a chute in coaling their boats. The chute, which is inclosed, holds about 50 tons. It is filled and when the vessel is in place the lower end is pulled up and the 50 tons of coal are dropped directly into the vessel's hold.

HOW TO FIGHT AGAINST CONSUMPTION.

Dr. Knopf, Whose Discussion Was Awarded First Prize at Berlin, Talks to Popular Mechanic's Readers.

By Dr. S. A. Knopf, who was awarded first prize for his discussion on the best methods of fighting consumption at the congress at Berlin.

To combat consumption as a disease of the masses successfully requires the combined action of a wise government, well trained physicians and intelligent public.

Consumption may be communicated in three ways---by the inhaling of the germ, by its being injested (that is eaten with the infected food) and by inoculation (that is the penetration of the tuberculous substance through a wound in the skin). One of the greatest dangers arises from promiscuous expectoration. The sick room should be thoroughly disinfected. Plenty of fresh air and sunlight are germ destroyers that should be had in abundance. Milk, unless it comes from cows that are known to be healthy and not tuberculous, should be boiled or sterilized. Domestic pets, such as dogs, cats, parrots and canary birds should never be kissed or caressed, for many of them are afflicted with tuberculosis. Trailing skirts and tight footwear should be avoided, the former because they gather up the deadly microbes and carry them home, and the latter because they not only hinder free movement, but by constricting the blood vessels, cause impaired circulation and coldness of the extremities. People should not sleep in the underclothing they have worn during the day and should bathe frequently, taking cold baths if their system will stand them.

The still very prevalent idea that night air is injurious is wrong. The night air is purer than that of the day, particularly in great cities, and therefore one should always keep at least one window open in the bed room or the room adjoining, so as to assure a sufficient and permanent ventilation. The temperature of living rooms should be between 65 and 68 degrees and the heat should not be too dry. Tobacco is very injurious to those predisposed to comsumption and alcoholic drinks makes a person especially liable to contract the disease.

FIGHTING FIRES IN POOR CONCEITED LONDON.

Firemen Bedeck Themselves in Gaudy Uniforms While Building Burns and Souls Perish.

By Charles Orlando Perkins.

I chanced to be in London a short time ago when there was a fire in a factory where a number of young girls were employed. A crowd gathered about the smoking building, and as several girls made their way to the roof and called for help, an onlooker suggested that it would be a good idea to notify the fire department which was a block away. The firemen were at dinner and insisted on finishing their meal before going to the rescue. One man was sent out, however, to buckle the harness on the horses. While he was doing this the firemen, after finishing their meal, proceeded to decorate themselves in their regulation fire-fighting uniform. It consists of glittering helmets, resplendent in burnished gold and silver; shining rubber boots; long coats with gilded buttons and belts with buckles that shine like flame. Properly arrayed the "fire-fighters" seated themselves on the engine wagon and ladder truck, and the horses were started. Then all the firemen began to yell "Hi, Hi, Hi, Hi," and the chorus was joined in by the crowd on the street. The engine resembled a large cooking stove with a toy smoke stack. On came the "Hi, Hi, Hi, Hi," and the wagon with its miniature wheels winded its way between the trucks and butchers' carts, stopping at the corner for the tram cars to pass. The buildings in London are substantially built and burn slowly, or otherwise half the town would have been in flames before this time.

When the firemen arrived they extended a thirty foot ladder expecting it to reach to a window seventy feet from the ground, where a group of the girls had assembled to escape the flames. Finding it too short they sent two men to a fire station across the river for a ladder which they said was longer. In the meantime the girls were becoming frantic in their fright, and people tore the awnings from buildings and stretching them out as life-nets, urged the girls to jump.

"There is no use in that," said the firemen, "the little heat and smoke the girls will receive up there may burn a bit, but will not hurt them seriously, and if they will keep from getting excited until the ladder comes, we will save them." But the flames were scorching the girls' hair and eyebrows, and they could not keep composed. Some rushed madly about and were burned to death in the building; some jumped and some were burned to death where they stood. Ten lost their lives and six were badly burned. But still the London firemen say they have the finest fire department in the world.

The Japanese government is endeavoring to stamp out the barbaric custom among the lower classes of using the heads of human bodies for medical purposes. The heads are charred over a fire and ground into powder, which is sold under the disguised name of tenseki.

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MAKE FLOUR FROM DRIED FISH.

Hot biscuit and fresh rolls made of fish flour may soon be familiar articles of food on our tables. The idea started in Norway where the people catch more fish than they know what to do with, and V. E. Nelson, United States Consul at Bergen, thinks the custom should be adopted in the United States. He says:

"A new and profitable branch of industry might be established in America by utilizing fish in this way. The flour is made by means of an invention which quickly dries and pulverizes the flesh of fresh fish. The fish flour, the resulting product, is easy to transport from one place to another and has great nutritive value.

THE MICROSCOPE SAVED $175,000.

When the German slow-burning powder made its appearance, and was tested in England, it was found to do much better than the English black powder. The Germans asked $175,000 for the secret, says the Engineering Times, of London. Sir Hiram Maxim found there was no chemical difference, though there was a mechanical difference. In the English powder the ingredients were very finely ground, intimately mixed, and pressed into one homogeneous mass. In the German powder the sulphur and charcoal were very finely ground and intimately mixed, but the oxygen bearing salt, that is, the nitre of potash, was distinctly granular. Sir Hiram discovered this by the aid of his microscope, and that the crystals varied from ½ to 2 thousandths of an inch. The mystery was solved and the money saved.

NEW CANE STRIPPER.

To strip sugar cane before cutting, E. W. Holdsombeck, Lawley, Ala., has constructed the device shown in the cut which is self-explanatory.

Sugar Cane Stripper.

Count de la Vaulx, of Paris, will soon make a second attempt to cross the Mediterranean sea in a balloon.

Remarkable Performance of a Cow

Twice Daily Crosses a River on a Narrow Timber--A Feat Few People Can Accomplish

The Cow Walking the Narrow Plank.

As an example of what steady nerves and absolute control of muscles can accomplish, Symmetrical Development, that interesting journal of physical culture, describes the remarkable performance of a cow. The saw mills of northern Wisconsin are usually located on the bank of some river. The logs cut during the winter are floated down stream to the mills and are caught and retained there by means of booms extending clear across the stream. These booms are usually made of long timbers, 12 inches square, placed end to end and securely fastened by short pieces of iron chain. The boom shown in the illustration is made in this manner, and extends across and some distance up the river, and is nearly half a mile in length. The constant splashing of the water keeps the floating timbers wet and slippery. The swift current, and the rolling and sinking of the boom as one steps upon it combine to make it a decidedly treacherous bridge, requiring steady nerves and some experience if one expects to keep from sliding into the water. Once upon the boom the traveller must keep moving or he will soon be seen deep in water, while a rapid walk takes him over each section before it has time to sink.

Allured by green fields on the farther shore one day, the subject of this article started across the narrow floating bridge which spans the river. Once started there was no chance to either turn back or stand still. A cow does not naturally object to walking into a stream, but will not plunge in as does a dog.

Steadily and methodically as a soldier marches the cow proceeded until the other shore was reached. When evening came there was no way to return save by the boom walk or swimming, so a return was made over the floats.

So much did Mrs. Cow appear to enjoy the novelty of the trip that she can be seen every day making the journey. From a little distance it appears as if the cow was actually walking upon the water. The illustration is made from an instantaneous photograph and shows the end of the boom at the left, partly covered with water as it sank under the weight of the animal.

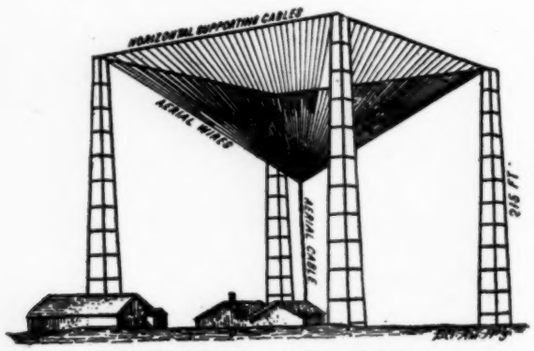
REMARKABLE FEAT OF RESUSCITATION.

Stanley F. Holmes, a boy, was rescued by the Anglesea, N. J., life saving station, after having been under water 25 minutes. His jaws were clinched, there was no perceptible breathing, and he had every appearance of a dead person. After 45 minutes laborious work, the boy gave a very slight gasp. Artificial respiration was kept up for an hour and a half. After four hours the child regained consciousness. Hot water bags and the usual methods of the service to restore respiration were employed. The only possible departure being smelling salts which is not usually included in the emergency remedies.

MARCONI RECEIVING STATION AT CAPE BRETON, N. S.

Work is progressing rapidly on the stations of the Marconi system of wireless telegraphy, and the inventor hopes shortly to have everything completed and in working order. The European station is located at Poldhu, Cornwall, while on this side one station is being erected on a high promontory at Cape Breton, Nova Scotia, and another at Cape Cod.

At Cape Breton the four towers, one of which is shown in the illustration, have been built. These towers are set 200 feet



Marconi Station at Cape Breton.

apart at the four corners of a square, and are 215 feet high. The towers are of timbers 3x12 inches; 9 feet square at the top and 30 feet at the base, resting on concrete foundations. Three sets of steel guy ropes 3 inches in diameter prevent the structures from being blown down.

A steel rope connects the four towers at the top. From these ropes depend 150 aerial wires 140 feet long, which meet in the center of the four towers and are united in a cable which descends and enters the receiving room on the ground, as seen in the cut, which is from the Scientific American. Recent improvements in the coherer are hoped to give a speed of several hundred words a minute, and it is intended before the end of the year to open service also to Cape Town, South Africa, and San Francisco.

REPELLING TORPEDO BOAT ATTACK.

In the Journal of the United States Artillery for June, published at the Artillery School, Fort Monroe, is a most interesting report of the meeting of the Board of Officers. These officers meet and decide on recommendations for various military and naval operations, which are afterward tested and if deemed successful are approved by the War Department and become standard. From the report we select an illustration as to action in case of torpedo boat attack.

The Torpedo Boat Attack.—The water area over which these boats can pass is very wide on account of their light draft. They have great speed, and are so colored as to be very inconspicuous. Their aim will be to pass the forts and destroy the shipping in the harbor.

As soon as the torpedo boat is covered by a light, all R. F. guns which can be brought to bear upon the vessel, will open fire without waiting for command; the object being to crush out the vessel as quickly as possible. If two or more boats are illuminated at the same time, the R. F. batteries will open upon the boats which are illuminated by the lights to which they are assigned. Heavy batteries will not open upon torpedo boats unless ordered to do so.

Should heavy batteries be directed upon torpedo boats they will fire by piece and not by salvo.

The several B. C.'s of heavy batteries, and all officers in charge of position finders, will range the vessel and send the range to the R. F. batteries as soon as possible. R. F. G. C.'s will not wait for the range data but will estimate range and open fire as soon as possible.

METHODS AND EXPENSE OF IRRIGATION.

Ditch System Much Cheaper Than Pumping—100 Foot Raise About the Limit.

The action of the last congress in providing the means for the beginning of governmental irrigation has attracted new interest to this interesting question. In the Irrigation Age for July, R. H. Yale of Beatrice, Neb., gives some rules and costs in this work.

It takes just as much power to lift a gallon of water, which weighs 8 1-3 pounds, a given distance as it does to raise coal or stone, and it will cost 100 times as much to raise the water 100 feet as it does to lift it 1 foot. Where irrigation is to be with pumped water the water should not be over 40 feet below the level of your fields. This is for usual farm crops. Where fruit and vegetables or other highly profitable crop is raised it may pay to pump as high as 100 feet. An open curbed well is best to pump from.

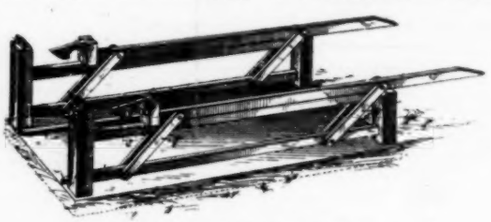
For power a windmill in conjunction with gas engine is best, using the engine when necessary and letting the windmill pump all night if it will. Store water in a reservoir. It will cost $1.15 per acre each year to pump with windmill and gas engine, and raise water 15 feet. This will suppy 10 acre inches of water to each acre. An acre of water is 27,154 gallons; 10 inches for the season of 180 days would be 271,540 gallons or 1,081 tons of water per acre per year.

The cost of irrigating with pumps, windmill and gas engine power per acre, per season of 180 days, for raising water various heights, is as follows: to elevate 15 feet, $1.15; 20 feet $1.38; 25 feet, $1.62; 30 feet, $1.85; 40 feet, $2.35.

The cost of ditch irrigation is much less, $15 per acre being a fair price for the water right, and 25 cents per acre annual rental. This with seven per cent on the $15 would make the cost $1.30 per acre per year.

HAY RACK LIFTER.

This device removes the hay rack from a wagon by simply driving the wagon between the parallel bars, which elevate the



This Device Lifts Hay Racks.

rack and hold it in position. It is replaced in much the same manner. The invention was made by Wm. J. Frank, Alcester, S. D.

NEEDS OF TRAVELERS OVER SIBERIAN RAILROAD.

Blankets, pillows, towels and soap should be carried by Americans traveling in Russia, according to the advice of Henry B. Miller, United States consul at Miuchwang. He also says that notwithstanding that eating houses are plentiful, a well-filled lunch basket will be found advantageous. At present only second class accommodations can be had from the Pacific to Irkutsk, but first-class trains are soon expected to cover the entire route. It takes eight days to make the trip from Irkutsk to St. Petersburg on fast trains. Seats should be engaged a day in advance. The fare is $62.57, sleeper $11.60.

A New York firm has just contracted for $1,000,000 worth of French automobiles to be delivered within one year. The machines range in value from $4,000 to $12,000.

WOULD HAVE THREE SCREWS ON FAST SHIPS.

Single Screw Vessels, Having No Other Motive Power, Are Subject to Many Perils.

Three screws for the fast vessels of the transatlantic lines are recommended by Admiral Melville, engineer in chief of the United States Navy, as the safest possible protection of modern ocean travelers. Several of the greatest accidents of late years have been traced directly to mishaps to the engines of single screw ships. Double hulls are also necessary. The puncture of the single hull of the Rio Janeiro, in sight of San Francisco, resulted in one of the most appalling maritime catastrophes in the history of navigation. The abolition of all sailing gear on these modern single screw vessels deprive them of any secondary motive power in the event of a breakdown of the machinery.

Admiral Melville urges that no mail contracts be awarded any ships which do not have at least twin screws and double bottoms. The double hull permits the division of the ship into compartments to such an extent that sinking is rendered well-nigh impossible. The cost of installation of twin screws is only 15 per cent greater than that of single screws and the cost of maintenance only 2 per cent greater. The additional expenditure is well warranted by the gain in safety and the reduction in the cost of insurance.

WOMEN HOLD PILOT'S LICENSE.

Dark brown hair, that unfurls to the wind as she stands at the helm, a clear bright complexion that is enough to drive the New York society belle wild with envy, trim figure, graceful bearing and surpassing culture—such is the Baltimore sailor girl, Miss Iona Iva Roe, one of the only two women on the Eastern seaboard holding a pilot's license. Miss Roe's license is for the navigation of a steamer of 100 tons or upwards on the Chesapeake Bay, Pamlico, and Roanoke sounds and tributaries. She is now studying for a navigator's license for the same waters covered by the pilot's license. Miss Carrie Boyce Hunter, of Snow Hill, Md., is the other of these two women holding pilot's licenses. Her license is for a 10-ton steamer on the Pocomoke river.

BUILDING A RAILROAD ACROSS SALT LAKE.

Most Remarkable Feat of Construction Ever Attempted—Queer Conditions Encountered in the Strange Water.

Crossing the Great Salt Lake on a train is a novel trip in store for American tourists as soon as the line now being constructed by the Southern Pacific railroad is completed. This will be one of the most unique railroad lines in the world, seemingly stretched along the surface of the water of the strange lake famed as a curiosity in every continent.

Because of the queer conditions in this apparently unnatural body of water, most remarkable and original methods of construction are being employed. When the water was reached the workmen were amazed to find that nearly everything would float on its surface. One of the laborers tried to prove that it would float a crow bar. The water is so dense that a man cannot sink and he can almost walk on its surface. A small raft of a few thin planks is sufficient to support a whole crew of workmen. The lake contains 14.8 per cent mineral water, mostly salt, and the workmen have found it difficult to get fresh water to qunech their thirst. The most remarkable part of the whole work is the digging of an artesian well in the midst of the lake. A bed of ashes was piled up in the water and in the center of this is being driven the artesian well. It will be driven deep enough to strike water from far below the bed of the lake and the tourist of the future may see fresh water gushing from a sea of salt.

Construction Crews at Work in Great Salt Lake.

In attempting to enter what was formerly the bed of the lake a thick salt crust was encountered and under this was a deep layer of mud which made it impossible to proceed in the regular way. To overcome the difficulty a heavy flooring was laid beside the stakes set for the main track and on this was gradually built a temporary track. From this trains of rock were unloaded to fill in a foundation for a permanent track. In building the temporary track sand in 100-pound sacks is brought to the end of the permanent track and loaded upon rafts, which are floated and poled to the front. The sacks are laid in the water south of the track center crosswise and as many layers deep as is necessary to raise the top to just above the water. The road is called the Ogden-Lucin cut-off and will be the main line of the Southern Pacific between Ogden and San Francisco.

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CROSSED THE OCEAN IN A KEROSENE LAUNCH.

Hazardous Experiences of Capt. Newman and His 6-Year-Old Boy in Their 38-Foot Boat.

By Capt. William C. Newman, who, with his six-year-old son, crossed the Atlantic ocean in a 38-foot kerosene launch, sailing from New York on July 9, and arriving at Falmouth, Eng., Aug. 14.

Our craft was the Abiel Abbott Low, named for the late father of New York's mayor, for whom I was for many years sailing master. We intended to make the 3,000 mile journey across the ocean in 20 days, and doubtless would have done so but for the many unexpected obstacles we encountered. Our launch has an 8 foot beam, a 3 foot 5 inch draft, and is strongly braced throughout. Tanks with a capacity of 800 gallons of kerosene were disposed around the sides. The motive power of the launch is a 10-horse-power kerosene engine, invented by Feodor C. Hirsch and presented by A. A. Low, brother of Mayor Low. We carried a 60 day supply of food and water.

A New Series of Studies in Electricity, by Prof. Dickinson, is now in preparation and will commence this month.

Well, we have made the trip across the ocean, but I would not care to undertake such an expedition again. We experienced awful times on the journey. Several times we nearly lost our drag anchor owing to the gear chafing away. We voyaged 3,103 miles. We had great trouble with the kerosene because the tanks broke and the oil flooded the cabin. My boy became ill and homesick. I suffered greatly from exposure and long sitting in one position. We spoke the steamer Kroonland, Aug. 1, in mid-Atlantic. After this we encountered a series of the most severe gales, and the hardships were so great, that I feared we would not survive. We did not speak another vessel until Aug. 13, when we met a fisherman 90 miles off the Sicily islands. Those last 90 miles were the longest I ever ran in my life. We rarely used the sail on the launch. I lost 30 pounds in weight on the trip, but my son seems to have derived benefit from the experience.

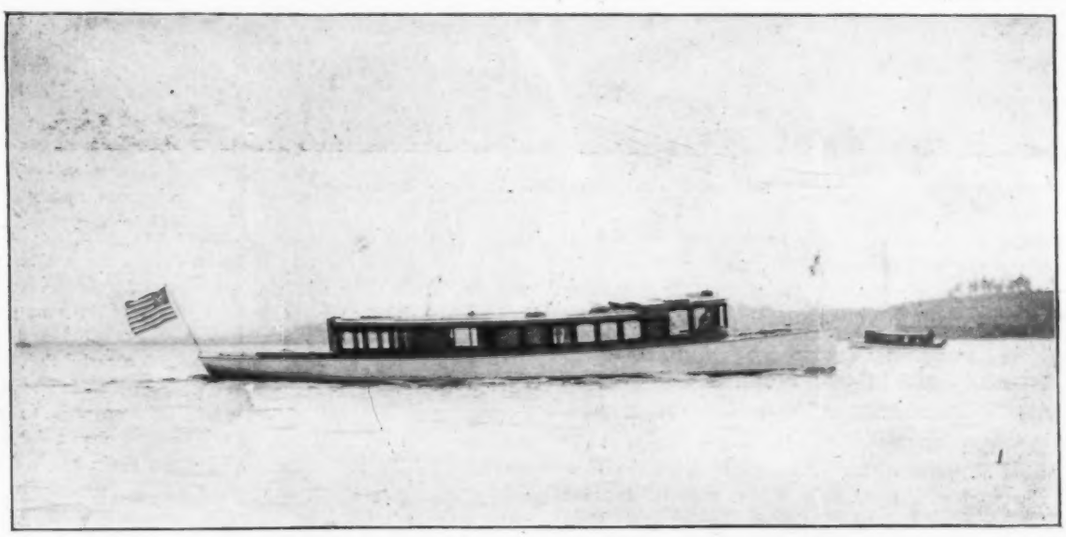
The illustration is from The Rudder, from a photograph taken expressly for that journal, and is the first authetic picture of the Abiel Abbott Low.

COMMERCE OF THE WORLD.

German experts have compiled the following table showing the commerce of the world in 1901:

Country	Value.	Country	Value.
Great Britain	£4,165,000,000	Switzerland	$380,800,000
British colonies, total	2,618,000,000	Spain	282,400,000
Germany	2,468,060,000	China	305,000,000
United States	2,118,200,000	Sweden	275,600,000
France	1,618,400,000	Argentina	280,000,000
Holland	1,332,800,000	Japan	238,000,000
Austria-Hungary	856,800,000	Brazil	238,000,000
Belgium	783,400,000	All other countries	4,624,340,000
Russia and Siberia	642,600,000	Total	23,800,600,000
Italy	571,200,000		

The noted antartic explorer, Borchgrevink, is on his way from Norway to America to arrange for the sailing of two ships in 1903, on an expedition to the south pole for the National Geographical Society at Washington.



This is the Smallest Launch that Ever Crossed an Ocean.

The St. Louis Terminal Association has decided to expend about $5,000,000 on terminal improvements in St. Louis to handle the traffic of the Louisiana Purchase Exposition.

LOCOMOTIVES OF A CENTURY.

This series of articles was interrupted because of our inability, at the time, to obtain the pictures of "missing links" in locomotive construction which were necessary to show the steady advancement from the earliest stages of steam propulsion to the present day. After a diligent search through locomotive works and mechanical museums, however, we have found all the types necessary to show the continued evolution of the locomotive. For the success of our efforts we are greatly indebted to the Baldwin Locomotive Works, but for whose assistance the pictorial history would doubtlessly have remained incomplete. The data contained in these articles was compiled by S. M. Vauclain, one of the most competent mechanical authorities in the world, and a mechanical writer of note.—Editor P. M.

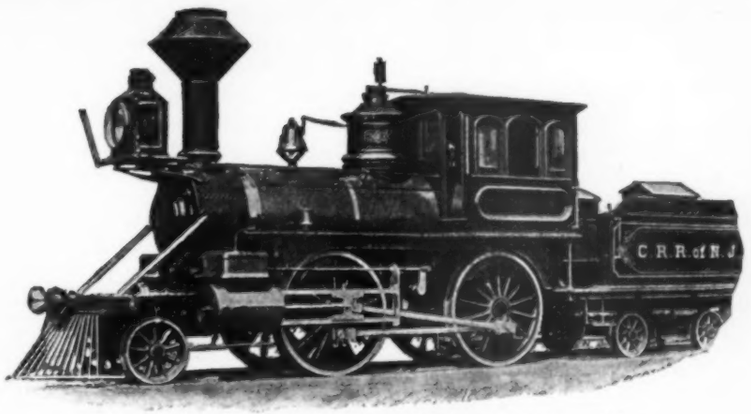


Fig. 32—Baldwin Consolidated Locomotive, 1866.

To John P. Laird, of Altoona, Pa., who in 1865 built the eight coupled locomotive with leading truck, shown in Fig. 30, should be given the credit of being the father of the consolidated type, which is such a favorite now. Two engines like the one shown in Fig. 30 were built by Laird in that year and both were cut up in 1869. He converted a number of camel engines on the Pennsylvania into moguls and went so far on the old Seneca as to omit the second pair of drivers and add the truck.

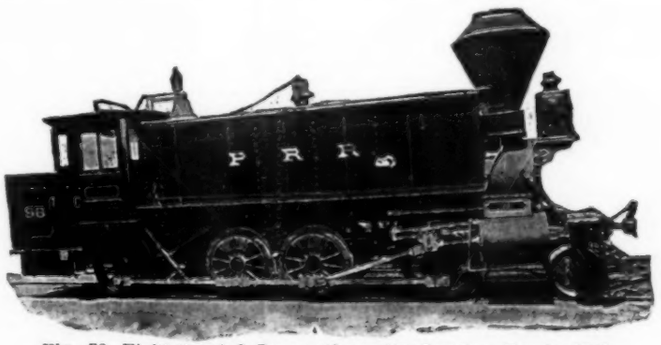


Fig. 30—Eight-Coupled Locomotive with Leading Truck, 1865.

The question as to the use of flanged tires on all drivers was settled even at that early day.

Steel fire boxes of English make, which were introduced in 1851, failed to give satisfaction and those of American manufacture were placed in engines like the one shown in Fig. 31 on the Pennsylvania road in 1862. Steel driving wheel tires were also introduced at this time.

In 1866 the "Consolidation," Fig. 32, was built by the Baldwin Locomotive Works from designs and specifications of Alexander Mitchell, and thus was firmly launched the first of a long line of successful locomotives that have penetrated almost every country on the globe where heavy traffic is found. This engine was built for the Lehigh Valley railroad.

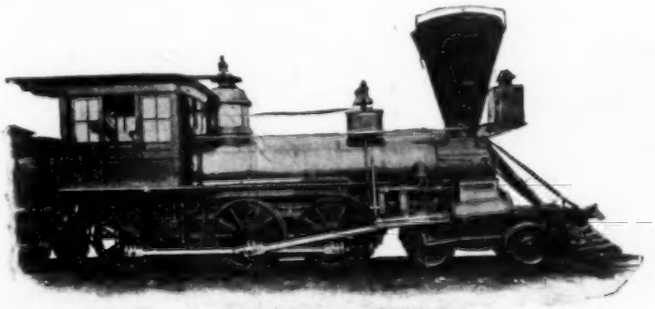


Fig. 31—Baldwin Locomotive with Steel Firebox, 1861.

CLAY PIPE FOR GAS MAINS.

The high price of iron, gas and water pipe has stimulated several companies to experiment with vitrified clay pipe, in the hope of being able to use it for gas and water mains. Tests made at the clay working department of the Ohio State University, showed that a section of clay pipe 2 feet long, 6 inches diameter and ½ inch thick would sustain a weight of 2,800 pounds suspended from the middle of the pipe. Trial mains of a few hundred feet were laid by gas companies in Columbus, O., and Denver, last fall, and great expectations were had of success. The following spring numerous bad leaks were found, in nearly every case being caused by the cracking of the bell at one end of the pipe, where it joined the next pipe. This was evidently caused by expansion. The joints were made tight with cement and hemp yarn, and remained perfectly tight until the ends of the pipes cracked.

The best authorities state it will be necessary to produce an entirely new kind of clay pipe from any yet made before the method can be a success. There would be an immense demand for the clay pipe if it could be made reliable.

TELLS THE TEMPERATURE OF A STOVE OVEN.

Oven thermometers are growing in popularity among house-wives as well as hotel keepers. With their aid the cook never has to guess as to whether the oven of her stove is at the right heat. An even or varying temperature can be maintained

An Oven Thermometer.

which aids wonderfully in the preparation of many dishes. We illustrate one of the most modern of the thermometers as they appear on the stove.

The new torpedo boat destroyer Chauncey made a maximum speed of 29.51 knots an hour at the trial trips at Philadelphia.

REMARKABLE METHOD OF FIRING CANNON.

Great Guns May Be Rotated on Ferris Wheel Structure and Fired Alternately.

Army ordinance officers are investigating a remarkable method of firing cannon, the invention of an Ohio man. The inventor places six guns between upright wheels, suspending them after the manner of the carriages in the Ferris wheel. By a simple mechanism, different angles of fire, the same for all the guns at one time, may be obtained. It is proposed to rotate the guns, loading them in succession from a conveniently placed platform. The inventor believes that any caliber of gun may be placed in his wheel. It is estimated that the twelve inch guns, which the Ohioan proposes to be thus placed, and his wheels would weigh 3,000,000 pounds. This does not take into consideration the axle and the other incidental mechanism.

AMERICA BEHIND IN WIRELESS TELEGRAPHY.

The United States is far behind other great nations in the advancement in wireless telegraphy. Renewed activity is being displayed, however, and there are hopes that Uncle Sam will be able to catch up. In the test of the Rochefort system by the board of naval officers recently, messages were sent and received with accuracy between Washington navy yard and the naval academy at Annapolis. It is now proposed to test in turn a French and two German systems.

There are but few officers of the navy working on the subject of wireless telegraphy, whereas Italy has more than a dozen naval officers conducting experiments. France has three boards of officers at work and several ships fitted with wireless telegraph instruments. England has 30 ships equipped with the Marconi system, and Germany has at least 10 vessels thus provided.

WHY AMERICA IS GREAT.

The principal articles of food are breadstuffs and meats. For breadstuffs the United States produces more wheat than any other country in the world, and more corn than all the other countries of the world combined. For meat the chief supply is beef and pork, and of each of these the United States produces more than any other country in the world. For clothing the quantity of cotton required by the world greatly exceeds that of any other material of dress, and of this the United States produces more than three-fourths of the world's supply. For heating the chief requirement is coal, and of this we now produce more than any other country and at a cost far below that in any other coal-producing section. For lighting petroleum is now the world's chief reliance, and we produce more of this article fit for use in lighting than any other country. The chief requirements of manufacturing are iron, steel, copper, lead, aluminum, cotton, leather and wood; and of all these we are the world's largest producers. These are a few of the reasons why America is great.

PORTABLE CAMP STOVE.

A portable camp stove which folds up to look like a traveling satchel is one of

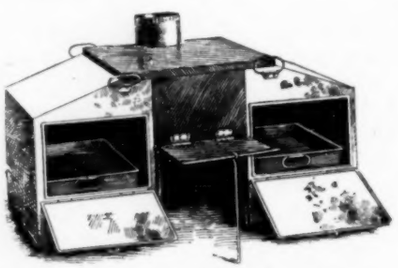


Fig. 1—Stove with Ovens Ready for Use.

the new things. When open the fire box comes between two ovens, but either oven can be removed from the fire at any time. The stove is for the use of camping parties.

For cruising parties the apparatus is so

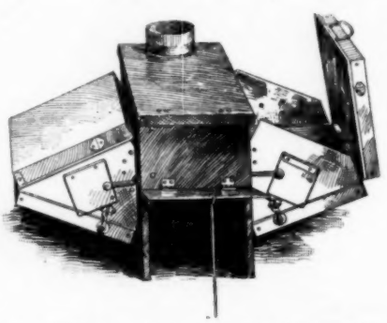


Fig. 2—Stove and Ovens for Cruising Parties.

arranged that it presents the appearance shown in Fig. 2. The joints in the construction are arranged to dovetail into each other and not a screw or clamp is used in the equipment. The stove will do all kinds of cooking that the house stove

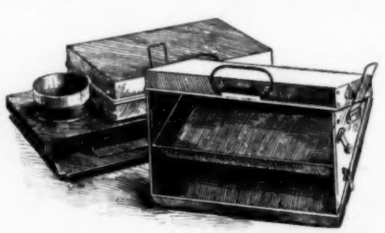


Fig. 3—Stove Folded for Journey.

does, and the heat in the fire box is concentrated on the sides. With a direct draft and a short piece of pipe a fire is only a matter of a few moments.

TO ADD ANOTHER STORY TO MASONIC TEMPLE.

Great Engineering Feat to Be Performed On Top of Skyscraper 354 Feet in Air.

The dome on top of the great Masonic temple in Chicago is to be lifted bodily while another story is added to the height of the building. The work will be carried on 354 feet in air. Already the dome rises 302 feet above the street level, and is surmounted by an observatory where thousands have stood to gaze out over the busy city, harbor and lake. It sits on top of the 21st or top story of the building. The additional story will make the temple 22 stories high. The work is to be carried on without disturbing the more than 6,000 occupants of the building, or the 44,000 people who daily go in and out of the structure. In making the alterations a total of 3,000,000 pounds or about 1,500 tons of iron and steel will have to be moved. The greater portion of this is in the observatory dome.

The Masonic Temple was built at a cost of $3,500,000. It contains 450 offices and stores. In the structure there are 10,000,000 pounds of steel and iron, and 785 car loads or 31,500,000. pounds of hollow tile. Fourteen fast going elevators haul the great stream of traffic up and down through the structure. The hydraulic pumps required to run these elevators would supply a city of 60,000 inhabitants with water.

The improvements are being made for the enlargement of the roof garden theatre which at present is between the 21st story and the dome.

TO CONNECT CONDENSER ON INDUCTION COIL.

Editor Popular Mechanics: In Vol. 2, No. 6, of Popular Mechanics, you describe how to make a Leyden jar or condenser. Now will you tell me how to connect it on an induction coil as described in Vol. 1, No. 6.

W. L. Goldin

Council Bluffs, Ia.

Answer: Connect outer coating of Leyden jar to one terminal of secondary coil. Connect the brass rod of the jar to other terminal of secondary. A more powerful coil than the one described in Vol. 1, No. 6, will probably be needed to secure success.

The enormous increase in the manufacture of steel and iron in this country is shown in our imports which increased $10,000,000 last year, while our exports decreased $19,000,000.

"Did you notice how she jabbered away when she sat there between those two men?" Goodness, yes! It made me think of a tongue sandwich."

FARMERS' CO-OPERATIVE TELEPHONE LINES.

They Are Economically Installed and Are Driving Monopolies From the Field.

With a little enterprise farmers may have their own independent telephone lines. They are of great advantage to the country merchant and he could not expend the same amount of money to better profit. The installation of the system is simple, inexpensive and the after costs are insignificant in comparison to the charges imposed by the telephone monopolies. In places where independent companies have been organized with the patrons as stockholders the other companies have been driven from the field. One instance related where the "trust" was forced to give free service but even then the farmers refused to patronize it because of the evident object of breaking up the independent system and again enforcing the exorbitant charges, and the monopoly had to leave the farmers' line in complete control. In speaking of one of these "co-operative lines," the Dry Goods Reporter says:

"Shares of stock had a par value of $25 which was the cost of a mile of line. The desire for 'phones spread so rapidly that the capitalization was increased four times, until at present there are about 700 farm 'phones in use, with new ones being added every day. The company is organized to furnish telephone service as near cost as possible and not with an idea of making a profit. Each farmer who wants a 'phone must take stock in the company. A share of stock is given him when he wants a mile of line. All these "main lines" belong to the company. The farmer is required to build a branch line necesary to reach his house, and that branch is his own property. He buys a 'phone, which is his own property. Toll messages from non-subscribers cost 10 cents and each stockholder pays 25 cents per month to go toward keeping up line repairs, paying switchboard operators, etc."

BLOOD FOR CLARIFYING WINES.

Eggs Also Serve Advantageously in a Process That Adds Much to the Value of the Juice.

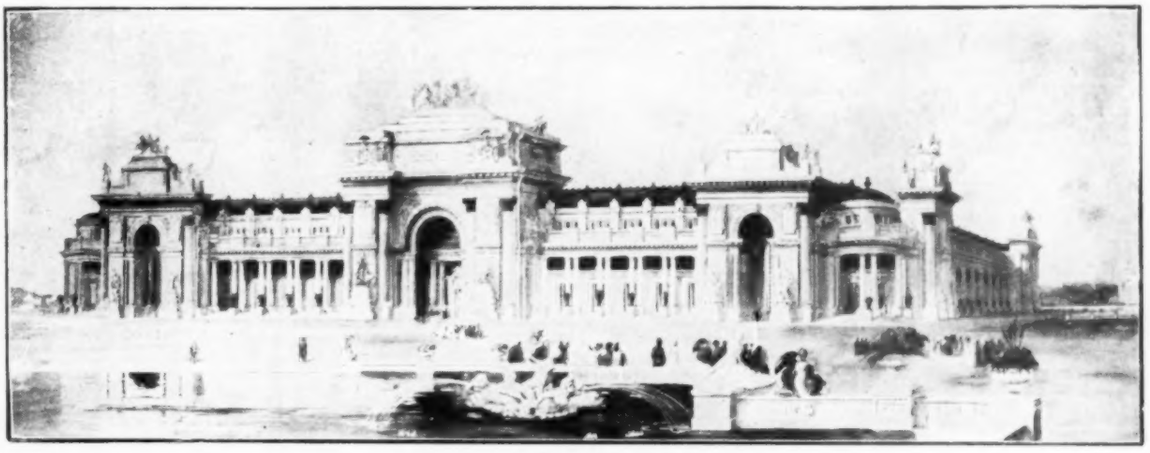
It is believed that if wine manufacturers in the United States would devote more attention to clarification and filtration American wines would become more popular at home and abroad. Fresh blood is much esteemed for clarifying purposes in Southern France where red wines are strongly colored. Blood has been successfully employed for wines made from raisins. Such blood must be used as soon as the animal is slaughtered and collected on the spot. One and three-fourths pints of blood are used to 220 gallons of wine to be clarified. The serum and clots which quickly form when the blood comes into contact with the air, are beaten up, first by adding a handful of salt, then gradually a small quantity of wine, equal to two or three times the quantity of blood. As soon as a pink froth covers the mixture the latter is thrown into the barrel of wine which is stirred vigorously. Blood is only suitable for strong wines, or those intended to be discolored—made rose-colored instead of red.

For fine red wines, the whites of eggs serve as an excellent clarifier. The eggs, says the "Grocers' Criterion," must be newly laid. The whites are beaten up with a little water, to which is added one-third to one-half an ounce of salt per egg; salt renders the albumen more soluble. When a thick froth is obtained the liquid is poured into the barrel. The wine is stirred sharply as in the case of the blood clarifier.

There is said to be a wood growing in the Philippines the fibers of which are hard enough to resist blows against metal. Native carpenters use hammer heads or mallets of this wood for driving nails, just as we use steel hammers.

WHERE BEAUTY AND ART WILL RIOT.

While its magnificent exterior will be a delight to the eye, it is the restful, cool and artistic internal court of the Liberal Arts building that will afford one of the greatest charms of the World's Fair at St. Louis in 1904. The court will be inclosed within a beautiful arcade forming a shady walk, lined with fountains, statuary and vases, reproduced from the Italian and Roman masters. Vines and flowers will adorn a garden walk at the attic story line. The lower court will be a retreat of gardens and fountains. There will be no interior columns, the exhibit space being spanned in one truss. An abundance of windows will furnish ample light and ventilation.



The Great Liberal Arts Building.

MID-OCEAN WIRELESS STATION FOR ENGLAND.

England will have a wireless telegraph station in mid-ocean if a scheme now on foot in Liverpool does not fall through. The station is to be combined with a mid-ocean post-office and signal station. According to the plans a ship, equipped with a search-light and a complete set of Marconi apparatus will be permanently moored at a point 110 miles west of the Lizard. This will require the use of a mooring chain nearly 500 feet long. As the weight of this chain would probably prevent the bows from riding buoyantly over the heavy seas the vessel will be provided with a hawser-pipe placed in the keel of the foremast. The search-light will have a vertical beam to illuminate the clouds and enable the floating post-office to be picked up at night from a distance of 60 miles or more. The vessel will serve as a floating station which can be approached in any state of weather and picked up for wireless communication.

An enterprising firm is arranging to have Aguinaldo come to the United States on a lecture tour.

SHOP NOTES

ASBESTOS PACKING FOR CYLINDERS.

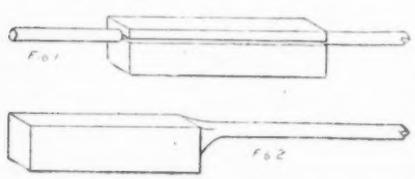
Experiments in Germany recently with asbestos packing for the cylinder heads of steam engines are reported to have given excellent results. A disc is made of the

Asbestos Packing.

proper size and holes punched as shown in the cut. A rope of asbestos is then threaded through the holes and woven back and forth until the entire disc is filled. When the cylinder head is bolted on the compression of the asbestos gives a perfectly tight packing, and one which will not burn out.

HOW TO MAKE AN ADJUSTABLE BORING TOOL.

A boring tool which a lathe operator may make for himself and which will save the annoyance of having the tool spring out of line while in operation is shown in the accompanying illustration, Fig. 1. It may be used for either short or long holes and can be adjusted to the length of hole so that very little springing of the tool is experienced. The body of the tool consists of a bar of steel about four inches long, says a contributor to Modern Machinery, and is of the same section as the body of the ordinary lathe tool. This body is drilled lengthwise near its top with a



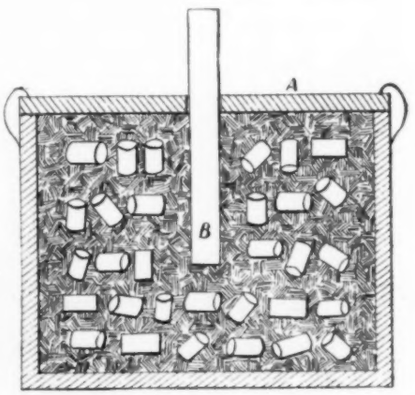
hole large enough to take tightly a rod of the size of the shank of a boring tool. This rod it cut about eight to ten inches long and is formed and ground on the one end as a boring tool or a threading tool, or for whatever inside work it is intended. The body of the tool is longitudinally split on one side, this split running through to the hole. The split permits the top of the body piece to spring enough to allow the rod to be slipped snugly into the hole. When using the tool the rod can be moved in and out in the body according to the length of the hole to be bored, and after the body has been clamped in the tool rest its top will bind on the rod and keep the latter from slipping from place. Several rods with the cutting ends ground for different purposes may be made to fit the same body, and as it is much cheaper to shape the end of a steel rod as a cutting tool than it is to forge out a complete tool, the device will be found to be economical as well as convenient. The common boring tool is shown in Fig. 2.

CARE OF RESERVE GAUGE GLASSES.

Comparatively few engineers realize how sensitive a gauge glass is to internal injuries. Many keep their spare glasses strung upon a nail somewhere out of harm's way. When this method of preserving them is adopted, nothing harder than a copper wire should be used, says the American Electrician. Glasses that are strung upon an iron or steel wire are very apt to break subsequently and apparently without cause, from the effects of the slight friction of the iron wire against their inner surfaces as they are strung upon it. The experiment of rubbing the inner surface of a gauge glass slightly with the end of an iron wire has been tried many times. The glass seldom breaks immediately, but however carefully it is put away, even when wrapped in cotton and placed in a receptacle where the temperature will be quite uniform, it is likely to break spontaneously in the course of time. This fact, which is abundantly established by repeated trials, will hardly be believed by those who have not made the experiment themselves.

HOW TO MAKE A CASE HARDENER'S "TELL-TALE."

The tell-tale is of great assistance in case hardening to the man who has not reached that advanced stage of experience when he scorns such aid. The tell-tale consists of a piece of round iron about the same size as the piece to be case hardened, if possible. A hole is made in the center of the box cover just large enough to receive the tell-tale snugly, but not tightly. The iron rod, says a contributor to Modern Machinery, should project far enough above the cover to allow it to be grasped with a pair of tongs, say about an inch and a half or two inches. Below the cover it extends well down into the bone and charcoal, or wnatever mixture is being used. The arrangement of the tell-tale with regard to the box, cover and pieces to be hardened is shown in the illustration, which represents a cross section through



Arrangement of the Tell-Tale.

the box, and in which A is the cover and B the tell-tale. When the box with its contents has been heated for a time that seems sufficient to the operator, open the oven door, and, with a pair of tongs, draw the tell-tale from the box. Care should be taken in doing this not to disturb the contents of the box. Plunge the iron rod immediately into cold water. If upon inspection the rod appears to be hardened to the desired depth, take out the box and dump its contents into the hardening tank. Of course, if the tell-tale does not show sufficient hardening the box must be left in the oven for more time. To make the matter more certain, two or even more tell-tales may be arranged in each box. This will avoid the necessity of guessing after the first rod has been removed and shows that the box must be left in the oven.

CLEANING THE WATER GAUGE CONNECTIONS.

Whenever the water level fluctuates in the glass we will generally find the connection between the glass and boiler is stopped up. Whenever these connnections are stopped the water maintains its level until the engine is started or load thrown on, when the water in the glass will rush up out of sight and remain so until the engine is stopped or the load thrown off, when the water will again fall to its true level, says Power. This fluctuation will continue as long as the connections remain dirty or scaly on the inside. Referring to Fig. 1, it will be seen that the brass plug at A can be removed to permit of inspection. By placing a light through the hand-hole and looking through the horizontal opening at A we can see if there is any scale or dirt, which scale should be cleaned out immediately. In almost every

case of water fluctuation this connection shown at A will be found to be closed, or partially so. In order to clean out this connection we should use a drill long enough to pass through the connection and into the boiler. The drill should be shaped like that shown in Fig. 2, having the end at C square, so that it can be inserted in a carpenter's brace. Of course the width at A must be less than the inside diameter of the pipe connection. By inserting the drill in the brace and applying it to the connection we can bore out any scale that may have formed through neglect to open the valve at B often enough. The valve at C should be a gate, so that the drill may pass

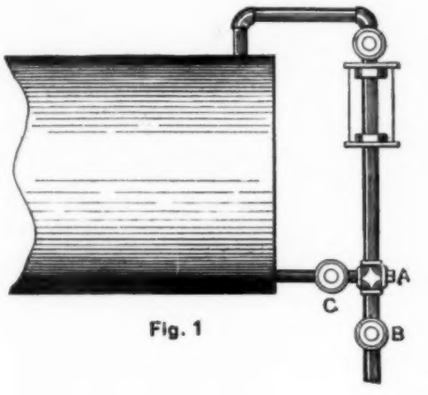


Fig. 1

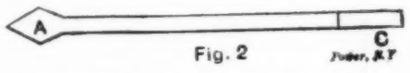


Fig. 2

Showing Water Gauge Connections.

through. On inspecting the gage glass we find the steam end to be worn away much faster than the water end. If we reverse the ends about every three months we can prolong its life considerably. In case the glass bursts the water valve should be shut first, as the water will burn much quicker than the steam.

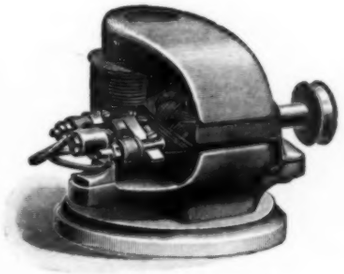
BRIQUETTES IN GERMANY—THE IDEAL FUEL.

By Frank H. Mason, United States Consul-General at Berlin.

Briquettes form the principal domestic fuel of Berlin and other cities and districts in Germany; they are used for locomotive and other steam firing, and are employed for heating in various processes of manufacture. They are manufactured from brown coal, peat and the dust and waste of coal mines. They are clean and convenient to handle; they light easily and quickly and burn with a clear intense flame; they make practically no smoke and are, withal, the cheapest form of fuel for most purposes. The total output of these briquettes manufactured last year was 1,543,416 tons. They sold for $3.16 a ton against $2.92 the year previous. The briquette syndicate produces to a large extent briquettes made from coal screenings, which require a matrix or binder of some plastic inflammable material, and for this purpose 116,956 tons of mineral pitch were used which cost on an average of about $10.25 per ton delivered.

SMALLEST DYNAMO MADE.

For students in electricity "The Midget," said to be the smallest dynamo on the market, is especially commendable as it practically illustrates the general practice in modern dynamo and motor design. It is sold by the Elbridge Electrical Manufacturing Co., Drawer 3, Elbridge, N. Y. The Midget will run equally as well as a motor or a dynamo. As a motor it may be run by the current from a few cells of carbon acid battery. As a dynamo it has an output of about 10 watts, and will readily light one of the Elbridge 6-candle-power miniature lamps. It is wound for


The Midget Dynamo.

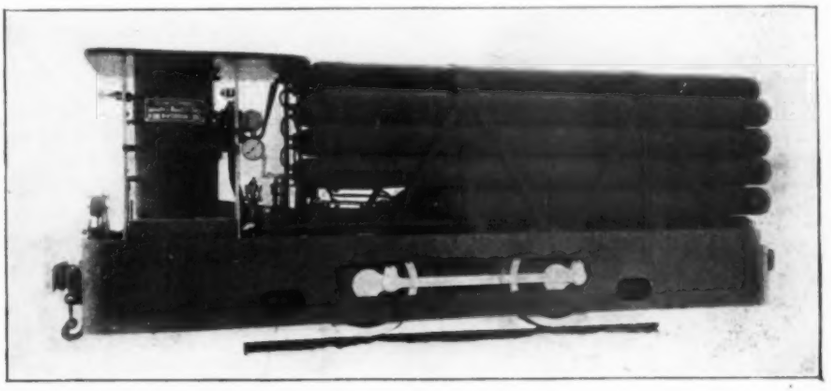
4, 8 or 10 volts as desired. The Midget weighs 3¼ pounds, the field coil is removable, the commutator has eight bars, it has every joint tooled, it has brass bearings and follows the design of the largest generators in the world today. It is just the thing for experimental work.

A large part of the $10,000,000 given by Andrew Carnegie to the Carnegie institution at Washington, will be devoted to carrying out of experiments concerning the origin of living things, which were begun at Woods Hole, Mass.

UNIQUE AIR LOCOMOTIVE.

Queer Machine Employed in Digging the Great Hole Through the Alps.

Building the great Simplon tunnel thirteen miles through the Alps from Breig, Switzerland, to Isalle, Italy, has given birth to new and remarkable mechanical devices. Probably the most important of these is the compressed air locomotive,


Compressed Air Locomotive Used in Simplon Tunnel.

shown in the accompanying illustration. The tunnel, which is the largest in the world, runs through snow covered mountains of a height which precludes intermediate shafts. The result is that unusual precautions are required to insure proper ventilation.

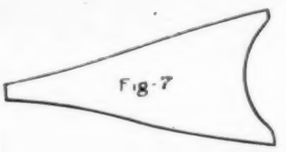
The locomotive pulls a train of cars, hauling them to where they are made into longer trains and picked up by steam engines. The machine, being under perfect control of the operator and easily managed, has proven an ideal of convenience. Guard rails, lanterns, a whistle and other attachments make the locomotive complete in all respects. It makes little noise in its work and is attractive in appearance. Compressed Air, a reliable authority on such topics, says:

The storage tanks or reservoir consists of a series of Mannesmann tubes mounted in layers above the frame and rigidly held in place by steel straps and lateral braces. The combined capacity is 70 cubic feet, and the storage pressure is from 70 to 80 atmospheres. The reservoirs are connected up so as to form three independent sections, so that should a leak occur in one it is only necessary to cut out this section when the engine will still have capacity enough to take it out of the tunnel or to a siding so as not to interrupt traffic. The air passes from the reservoirs through a reducing valve whereby its pressure is dropped to from 10 to 15 atmospheres, and then through a reheating tank which is charged with superheated water, where its temperature is raised making it more effective. The exhaust air is of service in ventilating the tunnel.

Summer Course in Easy Mechanics For Boys.

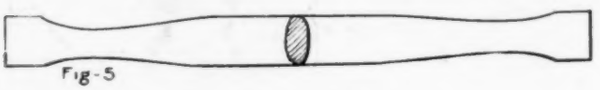
By Wilbert S. Drew.

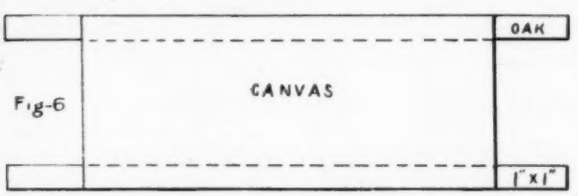
[This series, commenced in issue of June 28, will continue each week. It will give instructions which any boy can understand, how to use carpenter's tools and make things. In doing this only a few tools will be required, and cost of material will be small. The articles to be made will include a boat, table and similar subjects.]



BUILDING A CANVAS CANOE.—PART III.

The canvas should be wide enough to extend entirely around the bottom of the canoe at the widest part without piecing, as this is troublesome and unsatisfactory. In putting the canvas on it should be marked by a pencil line down the middle, and this line made to coincide with the center line of the canoe. It should be stretched very tightly so as to prevent all wrinkles and tacked in place with small copper tacks along the gunwales. After tacking, the canvas should be cut off even with the top

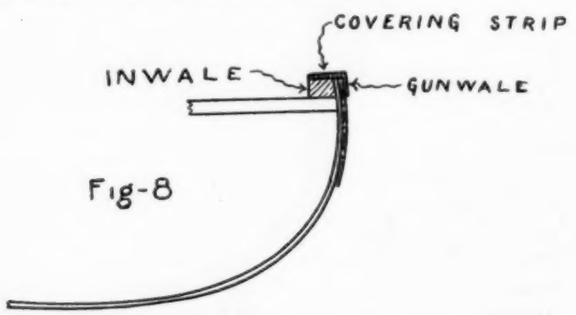




of the gunwales. Tack one side of the canvas along the front of the stem and stern posts, cover well with white lead, then lap the other side over the first and tack this in place, spacing the tacks midway between the first row. Manufacturers use a hand vise connected to a set of small pulley blocks and a rope for stretching the canvas, but it may be done fairly well by nailing a strip of wood 1x16 inches each side of the canvas at the place to be stretched. One person does the stretching by pulling on the wooden strips while another does the tacking.

The canvas is now given one or two coats of sizing, which should fill the texture of the goods and leave a smooth surface. When this is thoroughly dry the outside is painted any color that suits the taste of the builder, and the wood work inside is given two coats of orange shellac and the whole allowed to dry, after which a coat of spar varnish is applied outside and in.

Before putting on the canvas, the inwales, one inch square in the center and tapering to three-fourths inch at the ends should be put in and fastened to each rib with small copper nails which are turned over and clinched. All but about four feet at each end may be nailed on, first boring small holes for



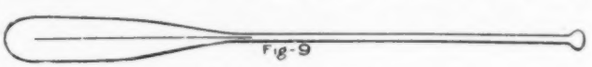
the nails; but before nailing the ends they must be steamed. Get a piece of rubber hose large enough to pass over the end of the inwale and long enough to cover four feet of it, and also to extend to the can used under the steam box. Make a wooden plug to fit the top of the can, having a hole bored through it large enough to just take in the hose. Wind a cloth loosely around the end of the hose so as to close the opening where the inwale enters it and get up steam. When the piece is very pliable remove the hose and nail in position as quickly as possible.

When all four ends have been secured, put in the braces shown in Fig. 5, and fasten them to the lower side of the inwales with stove bolts. There are two of these braces, one at five feet from the end of the canoe. They should be made of strong, straight grained, hard wood.

After the canvas is on and painted, the gunwales are next put on. These are one-quarter inch thick, one inch wide at the center and taper to three-fourths inch at the ends. They are put on in the same manner as the inwales, but extend one inch beyond the stem and stern posts where they are fastened to each other.

Two seats are provided and are made as shown in Fig. 6. One of them is placed just in front of the after deck and the other just forward of the forward brace. The cross pieces for these seats are bolted to the under side of the inwale with one-fourth inch stove bolts.

A strip of wood one-fourth or three-sixteenths inch thick and just wide enough to extend across the inwale and gunwale is now secured in place after putting on the decks, and runs from stem to stern on each side. The decks are one foot



long, seven-eighths inch thick and may be made of any kind of hard wood. A sketch of one of them is shown in Fig. 7. They are held in place by screws passing through the inwale from the outside and the covering strips run along the deck and to the end of the gunwales. These strips are tapered off of course at the ends to match the inwales. Fig. 8 is a cross section showing the relation of these parts.

The same directions given for making oars for a row boat will apply to the canoe paddles, a drawing of which appears in Fig. 9.

Many details must necessarily be omitted in an article so condensed as this, but they may be readily supplied by the ingenuity of the amateur builder.

A strip of three-eighth inch half round brass should be fastened to the stem and stern posts with small brass screws, to cover up the lap in the canvas and make a smooth finish. The lower end of these strips should be tapered off to nearly a sharp edge so as to leave the bottom smooth.

Next week we will describe the building of a camp large enough to accommodate from four to six persons.

Santos Dumont's airship which circled the Eiffel tower, and which was booked for the flight over New York and vicinity, was badly injured recenty by the caving in of a shed in New York, under which the machine was kept. The shed gave way under the load of curious peepers on top.

Paris is to have skyscrapers. The council has just passed an ordinance removing the limit to the height of buildings, and already architects are working on plans for several fifteen story structures.

Laundries of the World

Being a series of interesting views of Laundries of the World personally gathered by Mr. Charles Dowst, editor of the National Laundry Journal, while studying the Laundry systems of all nations. These views portray the curious and unique customs of many lands.

THE SCOTTISH HIGHLANDERS.—This picture indicates that this portion of Scotland is behind the times in the matter of laundry work. But they at least have tubs and clothes baskets, and though the large iron kettle brings up visions of home-made soft soap, and though it looks as if the two old dames standing in the tub were treading the clothes as the Algerians do on the rocks, yet there is some sign of improvement. It is perhaps safe to say that before long, a new era may be inaugurated in the highlands, and even a steam laundry is not an improbable improvement to be hoped for.

ELECTRIC DANGER SIGNALS FOR TUNNELS.

The Erie railroad enters Jersey City through the Bergen tunnel, cut through the solid rock for 4,400 feet. On account of the large number of trains constantly passing through this tunnel, an electric safety device has been installed. Every 200 feet signal boxes are fastened to the wall of the tunnel, and in each box is a plug easily found with the hand even in the dark. If an accident occurs, or a train is obliged to stop, the trainmen hasten to the nearest box and remove the plug. Instantly the tunnel is ablaze with electric signal lights placed upon the tunnel walls at intervals of 50 feet. The lights are placed so as to come on a line with the window used by the engineer of a locomotive and cannot be missed even when the tunnel is full of smoke. The boxes are marked by a large white plate on the track making it easy to find them. Turning on the lights also sends an alarm to the train dispatchers.

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After mature deliberation and through tests the General Carriage board at Washington has adopted a report favorable to the disappearing gun carriage system as compared with the barbette type.

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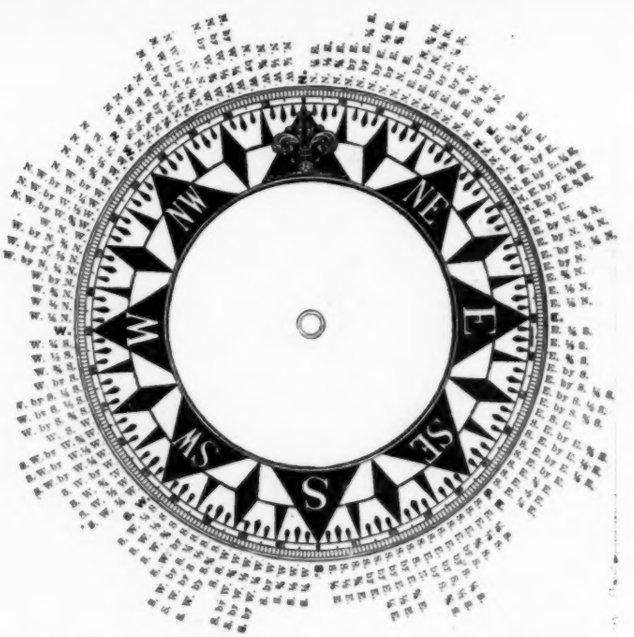

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TINIEST CITY IN THE WORLD.

Fenton, Mo., is obtaining considerable notoriety in Europe as being the tiniest city in the world as well as the happiest. Fenton is situated on the Meramec river, 15 miles southwest of St. Louis.

This Liliputian city which boasts a mayor and a full posse of officials, has a population of 100; and when it was incorporated twenty years ago its citizens numbered 45, at least a third of whom held high office. No salaries are paid to any officer however exalted. Remuneration takes the form of fees for duties discharged; and as duties are conspicuous by their absence, many of the officials are content to serve a number of years without the most modest honorarium. The city marshal constitutes the entire police force of this ideal city, and as no arrest has been made for three years, it is to be hoped that this officer has some other source of income. The last magistrate died 10 years ago, and his successor is still unelected; and no election of any kind has been known within the city boundary since 1887.

WORKING VULCANITE.

As is well known, vulcanite, or ebonite, is greatly used in electrical industries on account of its high insulation resistance, as well as for the better finish which can be given to it; and although many articles come from the factory in a finished state, it is met with in the workshop mostly in the form of rods and sheets, and must be worked with the same tools as are used for working metals. The best qualities, says the American Electrician, show on fracture a lustre something of the nature of jet, and the poorer qualities show a corresponding dullness. Although easy to machine, it is hard on tools; and in sawing, turning, planing or milling the best speed is that at which brass is machined, and milling should always be accompanied by a free use of soap and water. In turning or sawing, lubricants should be avoided, on account of the spattering around of ebonite cuttings and soapy water.

NOTICE TO AMATEUR ELECTRICIANS.

We would esteem it a favor if those of our readers who have made any or all of the apparatus and instruments described during the past six months in "Easy Electrical Experiments," would send us their names and a list of what has been made. Readers may also send in suggestions as to what other opparatus or electrical experiments they would like described in future issues. We will select such subjects for publication as receive the larger number of requests.

The Editor.

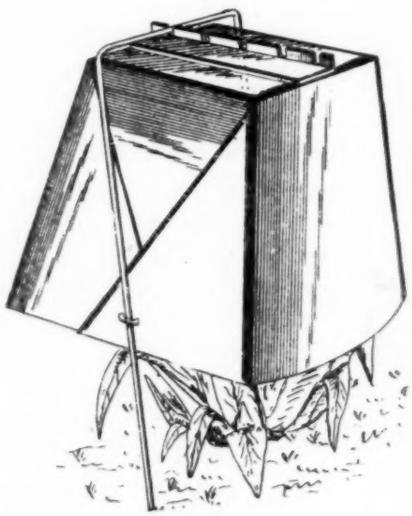
CAISSON FOR CLEANING SHIP'S SIDES.

A floating caisson for cleaning the sides of ships has been invented by Robert Vaucher, of Rochester, N. Y. The caisson is intended to be let down over the sides of the vessel and by means of revolving brushes driven by hand or other power inside, clean the hull. The caisson may also be used as a life raft.

Unless ordered soon steel rails will be hard to get next year; 1,750,000 tons are already ordered for delivery in 1903, and bessemer steel has advanced another dollar a ton.

TO PROTECT PLANTS FROM FROST OR HEAT.

This device is the idea of Jas. W. Ross, Alma, Ill. A hood is fastened to two rods the ends of which are thrust into the ground to hold it in position. The hoods



Plant Cover.

are smaller at one end than the other and by inserting one hood in another many of them may be carried in a comparatively small space.

THE "TIE UP" AFFORDS A DOUBLE THRILL.

Coney Island's latest thrill is the "tip up." The machine is a combination of twin Ferris wheels with an elaborate teeter. The wheels, to which four cars are attached, Ferris fashion, are about 40 feet in diameter, and are pivoted on the ends of the teeter board, which is a steel truss more than 150 feet long, swinging at the center on a steel tower 50 feet high. One end of the enormous beam tips up and its wheel goes around, while the wheel at the opposite end stops as it goes down. It is claimed that mixing the

The "Tip-Up."

two kind of horrors makes a blend which the most blase Coney Islander cannot resist. The oldest and most inveterate shooter of the chutes and looper of the loops cannot be tipped up without a genuine sense of novelty and a convulsive thrill of excitement.

WOMAN PILOT ON THE MISSISSIPPI.

Mrs. John Golden, of Jeffersonville, Ind., has been granted a license to pilot steamers on the Ohio and Mississippi rivers, and has already made her first trip as a licensed officer at the helm of the steamer Shawnee. Mrs. Golden, before her marriage, was Miss Emma Francis, and was born and reared in Jeffersonville. Since her marriage she has devoted her time to the river and has traversed the various waters of the south with her husband, Capt. Golden. She has thus acquired a knowledge of the small rivers and bays as well as the large streams.

John D. Rockefeller is the richest man in the world, Andrew Carnegie is the next richest, and Marshall Field, who is worth but $200,000,000, is third.

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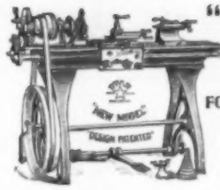

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